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UNITED STATES DEPARTMENT OF AGRICULTURE

BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE

Project h-1-1.2

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TITLE

FIRST YEAR RESULTS OF THE
PINE BEETLE CONTROL LOGGING EXPERIMENT
OF THE
WEYERHAEUSER TIMBER COMPANY
Rail Glade Area - Bly District, Oregon

By

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November 18, 1941

SUBJECT-

INDEX No.-

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Introduction

In the summer of 1940, a tract of approximately 1000 acres of marginal ponderosa pine, belonging to the Weyerhaeuser Timber Company, was set aside for an experiment to test the efficacy of pine beetle control through sanitation-salvage logging.

High risk trees representing from 15 to 22 percent of the volume of the stand were marked by the writer and assistants from the Portland Forest Insect Laboratory of the Bureau of Entomology and Plant Quarantine during late May and early June. These marked trees were subsequently logged out by a contractor and sold to the Ivory Pine Company. This phase of the work was under the supervision of Mr. Tom J. Orr, Jr., forester for the Weyerhaeuser Timber Company.

A detailed report giving information on stand conditions, losses from pine beetles, and amount of timber marked for cutting was issued on November 13, 1940.^{1/} During the past year, the experimental area has been carefully checked for subsequent timber losses. The present report summarizes the first year's results of the sanitation-salvage logging method of pine beetle control.

Area Covered and Volume of Timber Removed

Originally 960 acres were marked for cutting but because of rough terrain and difficulties encountered in developing this new method of light cutting, approximately 180 acres were not reached by the loggers. The attached map shows the number of marked trees which were left on the area and their concentration in certain parts of the area indicates the portions not reached by the logging. A recheck of marked trees left standing shows that 71 percent of the marked volume was salvaged. (See Table 1.)

^{1/} Pine beetle control logging experiment of the Weyerhaeuser Timber Company, Bly District, Oregon. Unpublished report, November 13, 1941. - F. P. Keen

Table 1

PROPORTION OF MARKED TREES SALVAGED

	<u>Acres</u>	<u>Trees</u>	<u>Volume</u>	<u>Percent</u>
Marked	960	1373	1,063,600	100
Left standing	<u>180</u>	<u>316</u>	<u>229,750</u>	<u>21.6</u>
Felled	780	1057	833,850	78.4
Cut and left on ground	—	<u>65</u>	<u>73,020</u>	<u>6.9</u>
Total salvaged	780	992	760,830*	71.5

TOTAL LOG SCALE DELIVERED

Marked risk trees	895,380*
Dead salvaged	<u>87,850</u>
Total salvaged	983,230

*The difference between these two volume figures represents the difference between the cruised volume and the actual log scale delivered. This indicates that the estimated volume was about 15 percent too low, either due to the volume table used, underestimating the number of logs in the trees, or both.

The trees cut and left on the ground, to a considerable extent, represented unmerchantable logs and in some cases logs missed by the loaders.

Comparison of Timber Losses

Timber losses from various causes including pine beetles, windfall, and fire were determined by 100 percent cruises of the entire area. The 1939 loss was determined by a cruise made from May 31 to June 7, 1940 and the 1940 loss was determined by cruises made on June 13 to 17, 1941 and again from September 3 to 5, 1941. The partial 1941 loss was obtained in the later cruise.

The 1939 loss before logging is shown in Table 2. This loss, averaging 91 board feet per acre, was used as the base for determining the amount of reduction due to treatment.

Table 2

BEETLE LOSS - 1939 ON EXPERIMENTAL BEETLE CONTROL AREA

<u>T.</u>	<u>R.</u>	<u>Sec.</u>	<u>Timbered Acres</u>	<u>Beetle Trees</u>	<u>Kill of 1939 Volume</u>	<u>Av. Vol. per Tree</u>	<u>Bd.Ft. Acre</u>	<u>Percent Stand</u>
35	14	14	190	33*	25,790	780	136	
		23	350	45	27,430	610	78	
		24	220	23	21,460	930	98	
		25	80	7	3,990	570	50	
		26	80	11	5,220	475	65	
		27	<u>40</u>	<u>4</u>	<u>3,810</u>	<u>950</u>	<u>95</u>	
Total			960	123	87,700	712	91	1.74

*10 treated in fall 1939 control work

The 1940 loss following logging is shown in Table 3. Since the marking of this tract was done in May and June 1940, before the 1940 beetle attacks had started, we can consider the 1940 loss as representing the first year's loss following treatment. Many of the trees marked for removal were attacked by beetles later in the summer before they were removed in logging, but these attacks were so new that little or no degrade from blue-staining was noticeable. Undoubtedly this removal of infestation in the trees and logs cut and taken to the mill had an important effect in reducing the beetle population on the area and in reducing the subsequent losses.

Table 3

BEETLE LOSS OF 1940

<u>T.</u>	<u>R.</u>	<u>Sec.</u>	<u>Timbered Acres</u>	<u>Beetle Trees</u>	<u>Kill of 1940 Volume</u>	<u>Av. Vol. Per Tree</u>	<u>Bd.Ft. Acre</u>	<u>Percent Stand</u>
35	14	14	190	6	1,620	270	8	
		23	350	15	8,070	538	23	
		24	220	15	10,590	706	48	
		25	80	6	3,970	662	50	
		26	80	2	800	400	10	
		27	<u>40</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>—</u>	
Total			960	44	25,050	569	26	0.50

This reduction in loss from 91 board feet per acre to 26 board feet per acre does not present the complete picture of results for it includes loss in marked trees left standing as well as unmarked trees. For instance for Sec. 25 where very little logging was done the 1939 loss of 50 board feet per acre continued in 1940, while in Sec. 14 where the most intensive logging was done the 1939 loss of 136 board feet per acre was reduced to 8 board feet per acre. It is therefore important to subdivide the 1940 loss according to causes of such loss, segregating that portion which was predicted in marked trees and the portion not expected in missed trees. This distribution of loss is shown in Table 4.

Table 4

DISTRIBUTION OF 1940 LOSS BY CAUSES

<u>Cause of Loss</u>	<u>Trees</u>	<u>Volume</u>	<u>Vol./Tree</u>	<u>Percent</u>
<u>Marked trees left standing</u>	<u>27</u>	<u>16,850</u>	<u>625</u>	<u>67.2</u>
<u>Unmarked Trees</u>				
Lightning struck	2	2,320	1,160	9.3
Near trap logs	3	2,440	813	9.7+
Broken tops	2	320	160	1.3
Unaccounted for	<u>10</u>	<u>3,120</u>	<u>312</u>	<u>12.5</u>
Total unmarked	<u>17</u>	<u>8,200</u>	<u>482</u>	<u>32.8</u>
TOTAL OF ALL CAUSES	44	25,050	569	100

Leaving out the anticipated loss in trees marked for cutting but left standing and the two lightning struck trees which could not have been predicted under any circumstances, the total 1940 loss not anticipated was represented by 15 trees with a volume of 5,880 board feet or 392 board feet per tree. Of these 15 trees, 5 were small unmerchantable trees and the largest tree killed had a volume of 750 board feet which was not more than the average size of all marked trees.

Thus the reduction in loss in the first year following logging can be computed as follows:

	<u>Trees</u>	<u>Volume</u>	<u>Reduction %</u>
<u>Total loss in 1939</u>	<u>123</u>	<u>87,700</u>	
Total loss in 1940	44	25,050	
<u>Total 1940 loss unaccounted for</u>	<u>15</u>	<u>5,880</u>	<u>93.3%</u>

Partial Results in Second Year Following Cutting

The loss cruise made in September 1941 could be expected to show up about 50 percent of the total 1941 loss. The total amount of 1941 loss found in this cruise was as shown in Table 5.

Table 5

PARTIAL BEETLE LOSS - 1941

<u>T.</u>	<u>R.</u>	<u>Sec.</u>	<u>Timbered Acres</u>	<u>Beetle Trees</u>	<u>Kill of 1941 Volume</u>	<u>Av. Vol. per Tree</u>	<u>Bd.Ft. Acre</u>	<u>Percent Stand</u>
35	14	14	190	1	90	90		
		23	350	7	4,930	704		
		24	220	6	4,050	675		
		25	80	2	1,390	695		
		26	80	0	0	0		
		27	<u>40</u>	<u>1</u>	<u>1,370</u>	<u>1,370</u>		
Partial loss cruised			960	17	11,830	696		
Estimated Total				34	23,660	696	25	0.48

The distribution of the partial 1941 loss by causes is shown in Table 6.

Table 6

DISTRIBUTION OF PARTIAL 1941 LOSS BY CAUSES

<u>Cause of Loss</u>	<u>Trees</u>	<u>Volume</u>	<u>Vol./Tree</u>	<u>Percent</u>
<u>Marked trees left standing</u>	7	6,290	900	53.2
<u>Unmarked Trees</u>				
Fire killed	3	1,770	590	15.0
Windfall	1	330	330	2.8
Broken top	1	1,370	1,370	11.6
Unaccounted for	<u>5</u>	<u>2,070</u>	414	17.4
Total unmarked	10	5,540	554	46.8
TOTAL ALL CAUSES	17	11,830	700	100

Loss in marked trees was anticipated, but no prediction could be made as to the loss from fire (slash burning in this case) or for windfall; therefore the only loss in 1941 chargeable as missed consisted of the 5 trees unaccounted for and the 1 broken top tree. If these 6 trees represent half the total 1941 loss then the reduction from 1939 was as follows:

	<u>Trees</u>	<u>Volume</u>	<u>Reduction</u>
Total loss in 1939	123	87,700	
Total loss in 1941 (estimated)	34	23,660	
Total 1941 loss unaccounted for	12	6,880	92.2%

This indicates that the effect of the logging has been to reduce the infestation on this area by more than 90 percent for a period of 2 years.

Normal Trend on Untreated Areas

The question arises as to how much of this reduction in loss was due to a normal reduction of infestation in the general area. It is therefore of interest to examine the loss record from nearby check plots not covered by control work. These are shown in the following table.

Table 7

TREND OF BEETLE LOSS ON UNDISTURBED CHECK PLOTS

<u>Check Sections</u>	<u>Volume of Pine Beetle Loss</u>		
	<u>1939</u>	<u>1940</u>	<u>Est. 1941</u>
Goodlow - T.39, R.13, sec. 5	42,160	47,320	19,100
Swede Cabin - T.36, R.15, sec. 25	37,540	46,040	--
Meryl Creek - T.35, R.15, sec. 20	73,880	108,580	129,700
Merritt Creek - T.33, R. 14 sec. 34	117,820	105,570	52,080
Total for 1939-1940	271,400	307,510	--
Total for 1940-1941		261,470	200,880
Trend	100%	113.5%	87.2%

(Meryl Creek check section, T. 35, R. 14, sec. 11, was not included because of control work done in 1939. The trend on this section was as follows:

Meryl Creek - T. 35, R. 14, sec. 11	182,048	88,720	86,447
Trend	100%	48.6%	47.4%)

It is obvious from the above that the peak of the recent infestation cycle was in 1940 with a subsequent marked drop in 1941. Therefore the 93 percent reduction on the sanitation-salvage logging area in 1940 was even more impressive since without this treatment a 13.5 percent increase in infestation might have been expected. The 92 percent reduction in loss for 1941 could be partly explained as a natural reduction, as the other check plots showed 12.8 percent reduction in 1941 loss from the 1939 level.

A comparison of infestation trends on treated and untreated areas is as follows:

	<u>Reduction from Loss in 1939</u>	
	<u>1940</u>	<u>Est. 1941</u>
Untreated checks	+13.5%	-12.8%
Fell-peel-burn control	-51.4	-52.6
Salvage logging	-93.3	-92.2

Summary

Sanitation-salvage logging was carried on during the summer of 1940 on an experimental area of 960 acres of Weyerhaeuser Timber Company's ponderosa pine lands north of Bly, Oregon. Of this area 780 acres were logged and 895,380 board feet of high risk trees were removed and sold to a local mill. This represented a cut of 1,150 board feet per acre, which was approximately 18 percent of the total stand.

Some 316 marked trees on about 180 acres were left standing, partly because of inaccessibility and partly because the logging couldn't be completed before winter weather set in.

The loss of 87,700 board feet in 1939 was reduced to a loss in unmarked trees of 5,880 board feet in 1940 or a reduction of 93.3 percent.

Preliminary figures for 1941 indicate an estimated loss of 6,880 board feet in unmarked trees or a 92.2 percent reduction in the second year following logging.

These reductions were obtained while the natural trend of infestation showed a 13.5 percent increase in 1940 and a 12.8 percent decrease in 1941.